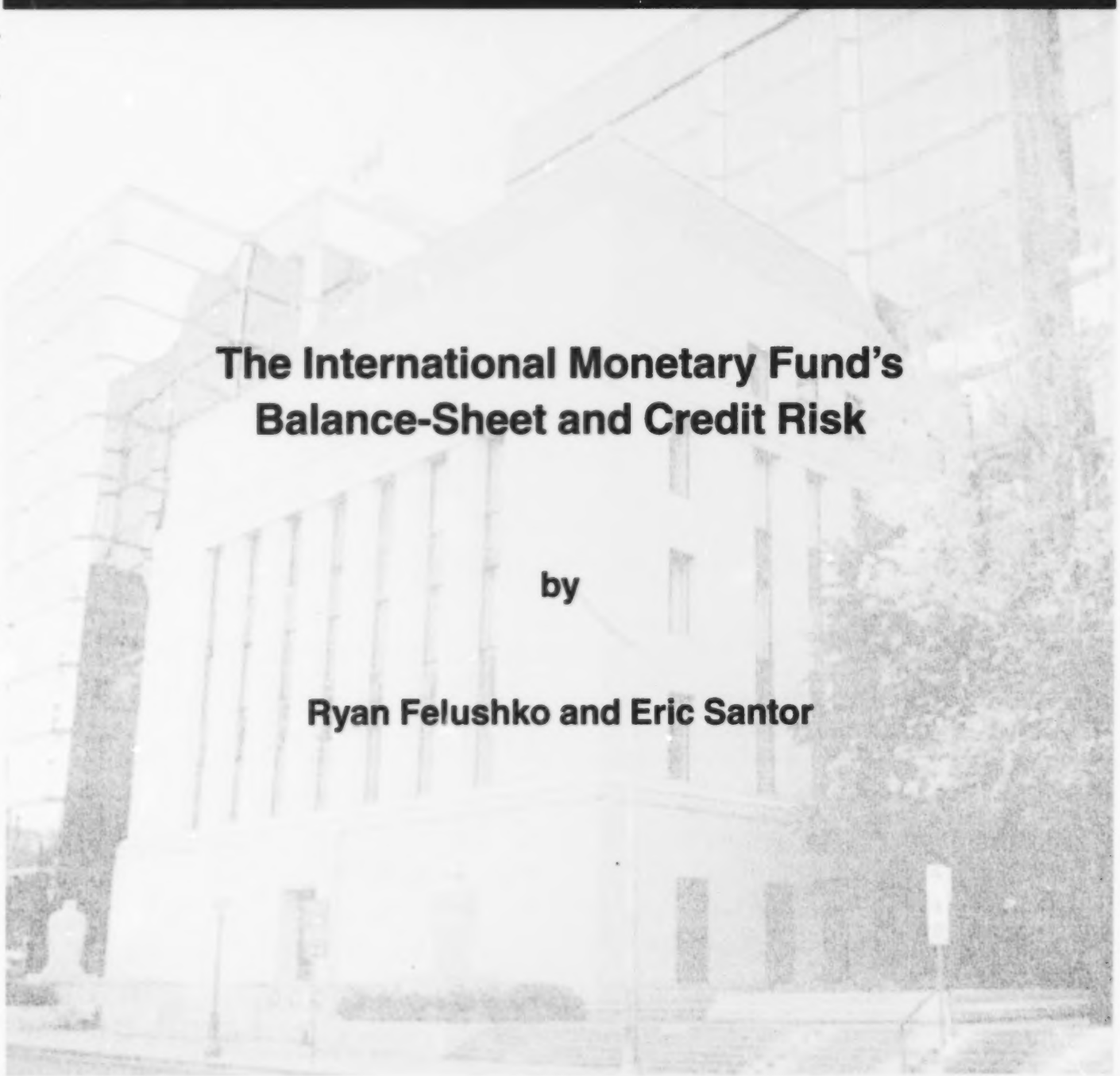
Bank of Canada Banque du Canada

Working Paper 2006-21 / Document de travail 2006-21



The International Monetary Fund's Balance-Sheet and Credit Risk

by

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ISSN 1192-5434

Printed in Canada on recycled paper

106-07252/

Bank of Canada Working Paper 2006-21

June 2006

The International Monetary Fund's Balance-Sheet and Credit Risk

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The views expressed in this paper are those of the authors.
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Contents

Acknowledgements iv
Abstract/Résumé v

1. Introduction 1

2. The Evolution of IMF Lending 3
   2.1 IMF lending 5
   2.2 IMF lending terms 5
   2.3 IMF member characteristics 7

3. Measuring Credit Risk 8
   3.1 Can the risk be measured at the IMF? 8
   3.2 Measuring expected credit loss: caveats 10
   3.3 Determining sovereign risk 11
   3.4 Determinants of sovereign credit ratings 12
   3.5 Expected credit loss 14
   3.6 Basel II capital requirements 17
   3.7 Market-based measures of expected credit loss 19

4. Discussion and Conclusion 20

Bibliography 23

Tables 24

Figures 30

Appendix A: Glossary 38

Appendix B: Data 39

Acknowledgements

We would like to thank Jim Haley, Robert Lafrance, François Painchaud, Graydon Paulin, Lynette Purda, Larry Schembri, and seminar participants at Rutgers University and Simon Fraser University for helpful comments.

Abstract

The authors examine the characteristics of International Monetary Fund (IMF) lending from the 1960s to 2005. They find that there has been an increase in portfolio concentration, that lending terms have effectively lengthened, and that the proportion of total lending that occurs due to exceptional access has risen dramatically. Moreover, the typical IMF borrower represents a greater risk burden than in previous periods. The authors estimate a model of expected credit loss for the IMF's portfolio and find that the credit risk being borne on the IMF's balance sheet is rising over time. This increase in the risk burden is supported by the use of alternative measures of balance-sheet risk: both the Basel II capital requirement approach and the market-based interest rate approach produce similar results.

JEL classification: F3
Bank classification: International topics

Résumé

Les auteurs étudient les caractéristiques des activités de prêteur du Fonds monétaire international (FMI) des années 1960 à 2005. Plusieurs constats se dégagent : le portefeuille de prêts du FMI est plus concentré qu'auparavant, il y a eu un allongement effectif de la durée des prêts, et la proportion des concours consentis au titre de l'accès exceptionnel a augmenté de façon spectaculaire. En outre, l'emprunteur type actuel de l'institution présente un fardeau de risque accru. Après avoir estimé un modèle relatif aux créances irrécouvrables anticipées pour le portefeuille du FMI, les auteurs observent que le risque de crédit qui pèse sur le bilan de l'institution croît au fil des ans. Cet alourdissement du fardeau de risque est corroboré par les indicateurs du risque bilan obtenus à l'aide de l'approche d'évaluation des exigences en fonds propres de Bâle II et de l'approche fondée sur les taux d'intérêt du marché.

Classification JEL : F3
Classification de la Banque : Questions internationales

1. Introduction

The ongoing strategic review of the International Monetary Fund (IMF) should provide the opportunity to assess the IMF's role, functions, and governance. Despite the apparently strong interest in the strategic review process by the IMF, G-7, G-20, and other interested groups, little actual reform has been proposed. In fact, most of the official discourse maintains that the IMF is still *the* key instrument with which to promote global financial stability, and that its role as a centre of multilateral coordination, surveillance, and advice, and as a provider of *temporary* finance, is still relevant.

This sanguine assessment of the IMF's role and activities stands in stark contrast to its recent experience. The IMF's role in the Asian crisis and subsequent actions in Russia, Argentina, Brazil, and Turkey have raised numerous concerns. In particular, critics have focused on the use of exceptional access: the granting of loans in excess of 300 per cent of quota. Exceptional access lending can lead to moral hazard, distortions, and delays in the restructuring of private sector claims, and it raises the potential that the IMF could experience a conflict of interest during debt restructuring negotiations, since it is not a *de minimus* lender. Moreover, exceptional access lending may have consequences for the IMF's balance sheet.

The growing use of exceptional access recently led to a sharp increase in concentration of IMF credit.[1] This has raised concerns about the financial impact of a single large borrower going into protracted arrears with the IMF. Recognizing the increased credit risk associated with the IMF's exposure, the Executive Directors approved in 2002 an ad hoc doubling of precautionary balances to about Special Drawing Rights (SDR) 10 billion.[2,3] At the same time, the Executive Directors asked the IMF staff

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[1] In 1985, the five largest borrowers accounted for around 43 per cent of total credit, increasing to 70 per cent in 1998 and 87 per cent in 2003.

[2] At the end of December 2005, precautionary balances amounted to around SDR7 billion. Precautionary balances are created from net income. At the current pace of accumulation, precautionary balances will reach the new target in roughly five years.

[3] A glossary of IMF terms, such as precautionary balances and SDR, is provided in Appendix A.

for a review of possible analytical approaches to assess the adequate level of precautionary balances.[4]

Precautionary balances play an extremely important role. They protect shareholders against arrears and default on credit outstanding, and shortfalls in income. The appropriate level of precautionary balances necessary to ensure the soundness of the IMF's balance sheet is difficult to assess, however, reflecting the nature of the institution. For instance, IMF credit is often concentrated among a few large borrowers who have recently suffered severe crises. This implies a high level of credit risk for the IMF's balance sheet and, consequently, one would expect that there would be a need for high levels of precautionary balances. The IMF's institutional characteristics, however, could mitigate the credit risk stemming from high levels of portfolio concentration and the implied high degree of risk that is associated with lending to countries that have recently suffered a crisis. For example, the IMF relies on conditionality, access limits, and preferred creditor status to mitigate credit risk.[5]

Despite the risk-mitigating features of IMF lending, the decision to increase precautionary balances to SDR10 billion by 2010 suggests that the risks to the IMF's balance sheet have risen in the past few years.[6] The objective of this paper is to determine whether the level of credit risk being borne on the IMF's balance sheet has increased over time. In particular, this paper will examine whether the provision of exceptional access lending led to a greater risk burden for the IMF. To address this question, we will first examine the nature of IMF lending and how it has evolved since the IMF's inception. We find that the IMF is no longer solely offering short-term revolving credits to offset

[4] In addition, reserve tranche positions are generally considered part of a country's international reserves. Therefore, shocks to the IMF's balance sheet that create doubts about the value or liquidity of reserve tranche positions would also affect balance sheets of central banks (and/or finance departments) around the world. Similarly, shocks that impair the IMF's balance sheet also serve to reduce its effective forward-commitment capacity.

[5] Technically, the IMF has not experienced a default in the past 50 years. It has experienced, however, protracted arrears. As of December 2005, four countries were in protracted arrears with the IMF: Liberia, Somalia, Sudan, and Zimbabwe. Similarly, many borrowers have accessed funds on an almost continuous basis, thereby reducing the IMF's forward-commitment capacity, raising doubts about borrowers' ability to eventually repay the IMF.

[6] While favourable global liquidity conditions have allowed two of the IMF's largest borrowers to repay the IMF, the likelihood of a return to high levels of exposure is not necessarily a low-probability event.

temporary balance-of-payments shocks to a set of countries that can alternately find themselves on either side of the balance sheet. Rather, the IMF seems to have de facto become a development bank with a set of permanent creditors and debtors, offering medium- to long-term loans to a set of serial borrowers with poor credit ratings. Given the changing nature of IMF lending patterns and borrower characteristics, we estimate a model of expected credit loss for the IMF's balance sheet from 1975 to 2005. The results suggest that the implicit risk on the IMF's balance sheet increased in the late 1990s, mostly due to the greater use of exceptional access lending programs. These results are supported by applying Basel II risk-weighted credit-risk measures, and a market-based interest rate credit-risk model, to the IMF's balance sheet.

This paper is organized as follows. Section 2 describes how the IMF's lending has evolved over time. This includes a description of IMF borrower characteristics, and their comparison with creditor countries. Section 3 assesses the risk in the IMF balance sheet utilizing an expected-credit-loss approach. These results are confirmed by the use of Basel II measures of risk-weighted assets and market-based interest rate credit-risk models. Section 4 offers some conclusions.

2. The Evolution of IMF Lending

The nature of IMF lending is the primary consideration in assessing the risk to the IMF's balance sheet. The IMF does not face a portfolio-allocation problem analogous to a private lending institution or, for that matter, the World Bank. Therefore, any examination of the IMF's portfolio-allocation decision must first take account of the IMF's objective function.

The IMF's Articles of Agreement, adopted in July 1944 and entered into force in December 1945, stated that the IMF would seek to provide the public good of international financial stability. Specifically, the IMF was created to spread the risks associated with idiosyncratic (temporary) shocks to members' balance of payments through short-term revolving credits, which encouraged members to eschew policies that might be *destructive of national and international prosperity*. Operationally, the IMF

would provide temporary assistance to finance temporary shocks to its members; IMF members could alternately be on both sides of the IMF's balance sheet. In this way, the IMF is an institution that exists to mitigate and manage risk among its members for their mutual benefit.

The functioning of the IMF, as demonstrated in the 1960s, was broadly consistent with the precepts set out above. In response to balance-of-payments crises, industrial countries often found themselves on either the creditor or debtor side of the balance sheet, and, in terms of the latter, for only a short period of time. For instance, during the 1960s, Canada, France, Spain, Australia, New Zealand, and the United Kingdom all borrowed from the IMF, for terms of one to six years. The subsequent collapse of the Bretton Woods system, however, dramatically changed the environment in which the IMF operated. The industrial countries that had once been on either side of the balance sheet emerged to become permanent creditors by the 1980s. With the advent of flexible exchange rate regimes and the development of capital markets—and their ability to have continual access to these markets, even in times of crisis—industrialized countries no longer needed access to IMF resources.

At the same time, a shift in IMF lending practices occurred in response to the Latin American debt crises of the 1980s. In addition to offering short-term loans to mitigate the consequences of balance-of-payments crises, the IMF offered longer-term loans in order to facilitate structural (primarily fiscal) adjustment and, following the collapse of the Soviet Union, systemic transformation. A key component of this type of lending was the ex ante imposition of strong conditionality. Similarly, the IMF's response to the financial and capital account crises of the 1990s reinforced this trend of long-term financing, albeit unintentionally in the context of "exceptional access." Countries such as Brazil, Argentina, and Turkey accessed IMF resources in even greater amounts for longer terms. Although there may be some benefits or "public good" associated with this development, this clearly does not fall within the IMF's original mandate. Quantifying this shift in IMF lending and the characteristics of its borrowers is fundamental to understanding the changing nature of risk in the IMF's balance sheet. The next section

describes how the IMF's balance sheet and the characteristics of its borrowers have evolved over time.

2.1 IMF lending

Since the IMF was formed, the level of its lending facilities has increased markedly, in absolute terms.[7] Figure 1 plots IMF lending in SDRs from 1961 to 2005.[8] The pattern of IMF lending reveals two notable features. First, there was a sharp increase in lending in response to the debt and financial crises in the early 1980s and late 1990s. Second, while the overall level of exposures has fallen dramatically in the latter part of 2005, the past ten years have witnessed higher levels of exposures. The ratio of loans to total IMF resources shows considerable variation over the sample period (Figure 2). While exposures were typically less than 20 per cent of total quota in the 1960s, this ratio rose quickly in the 1970s and early 1980s to over 40 per cent, and averaged 25 per cent after the 1990s. The proportion of total exposures attributed to the five largest borrowers also shows considerable variation over time. Figure 3 plots the degree of concentration for the IMF's five largest borrowers as a percentage of the total loan portfolio from 1961 to 2005. Interestingly, portfolio concentration in the 1960s was greater than for the 1970s and 1980s, although concentration increased considerably in recent years.[9]

2.2 IMF lending terms

The nature of IMF lending terms with respect to the length of exposures has changed significantly over time. Figure 4 shows the average number of years over the previous 15 years for which IMF borrowers had non-zero obligations to the IMF. The striking result is the persistence of IMF lending. For example, the average number of years of exposures

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[7] IMF lending has remained relatively steady as a percentage of world GDP, but has fallen as a proportion of overall global capital flows, since private capital flows today dwarf the available resources of the IMF.

[8] The data on IMF lending programs are taken from IMF financial reports. Macroeconomic data are taken from the *International Financial Statistics* and *World Economic Outlook*, and from the World Bank. Political risk data are taken from the *International Country Risk Guide* and institutional data are taken from LLSV (1999). Sovereign credit ratings, default rates, and recovery rates are from Moody's and Standard & Poor's. Currency crisis dates are from Glick and Hutchinson (1999), updated to the current period. Details of the data are provided in Appendix B.

[9] In the 1960s, portfolio concentration was attributable mostly to large programs for the United Kingdom in response to episodic pound crises. However, the size of these programs was smaller as a percentage of GDP relative to more recent programs for Argentina, Turkey, and Brazil.

in the previous 15 years for the typical IMF borrower in 2005 is 12 years (for the previous 10 years, the average is 9 years). This compares to an average length of exposure of only 6.5 years in 1975. Thus, the notion that the IMF is providing "revolving short-term credits" is not, in fact, true: rather, it would appear that the IMF is effectively giving long-term credits to serial borrowers.[10]

The increasing length of IMF exposures is not the only dramatic change in IMF lending. Since the establishment of the exceptional access framework, many countries have been able to borrow formally in excess of 300 per cent of quota. For instance, in the 1980s, only a few countries had exposures over 300 per cent of quota (with most under 400 per cent). By the late 1990s, however, when the exceptional access framework was established, the proportion of total loans accounted for by lending beyond 300 per cent climbed dramatically: close to 75 per cent of outstanding credit in 2004 was in the form of exceptional access (Figure 5).[11]

Lastly, there is considerable variation in the rates of charge on IMF credit over time (Figure 6). The variation in the rate of charge, however, reflects movements in the short-term interest rates of the major economies that make up the SDR interest rate, and are not necessarily an endogenous rate of charge linked to credit risk. Nevertheless, the exceptional access framework does allow for higher rates of charge. For example, a surcharge of 300 to 500 basis points is added to the standard rate of charge for loans under the Supplemental Reserve Facility. Similarly, when credit outstanding is above 200 per cent of quota, there is an additional charge of 100 to 200 basis points. While the basic rate of charge for normal levels of access is quite modest, the higher rates of charge for exceptional access suggest that there is some additional risk associated with larger exposures.[12] Despite the higher rate of charges, exceptional access loans still represent a direct subsidy, since the rate of charge is often far below prevailing market rates. For

[10] IMF supporters have suggested that "serial" lending reflects the more volatile nature of the underlying real economy for today's IMF borrowers, and hence the greater need for more frequent and extended programs. There is no clear evidence, however, that the world economy is more volatile than in the past.

[11] Equally troubling is the level of exceptional access: some countries have borrowed 1700 per cent of quota.

[12] There is little evidence, however, that these interest rate surcharges are directly related to the country-specific credit risk of the borrower.

example, the average SDR interest rate in 2002 was 2.2 per cent, while the emerging-market bond index (EMBI) spread for Argentina, Brazil, and Turkey was over 57.9 per cent, 13.8 per cent, and 7.5 per cent, respectively.

In summary, the IMF's portfolio has evolved considerably over the past 25 years. While portfolio concentration has varied over this period, it has recently increased. At the same time, lending terms have effectively lengthened. Moreover, the proportion of total lending that occurs due to exceptional access has risen dramatically. The question is whether these changes have led to an increase in risk being borne by the IMF. That is, are the borrowers that are accessing resources for longer periods in greater amounts as riskless as before? A closer look at the characteristics of countries that borrow from the IMF is warranted.

2.3 IMF member characteristics

Table 1 provides descriptive statistics of macroeconomic indicators for IMF borrowers and creditors by decade from 1961 to 2004. Average real GDP per capita of an IMF borrower from the 1960s to the 1990s and beyond was approximately $2700.[13] The median per capita GDP of an IMF borrower, however, is higher in the 1990s. The differences between IMF borrowers and creditors are dramatic: IMF borrowers have lower real GDP per capita than creditors, and this gap has widened over time. Similarly, the real GDP growth performance of IMF borrowers has deteriorated since the 1960s. Likewise, the inflation performance of IMF borrowers is not encouraging, since inflation has remained high at both the mean and median. While IMF borrowers are becoming more open, current account deficits remain a persistent problem.[14] Interestingly, the level of reserves-to-GDP has risen over time for borrowers, although it is still far below the

[13] The data from the 1960s are only suggestive, since data are scarce for less-developed countries. Anecdotal evidence, however, highlights the differences between the level of development for IMF borrowers in the 1960s and today. IMF borrowers in the 1960s included Canada, France, Spain, Australia, New Zealand, and the United Kingdom; comparable countries do not borrow from the IMF today.

[14] Current account deficits are not necessarily a problem, since they may reflect capital inflows for investment. They do, however, imply increased foreign borrowing.

levels of creditors.[15] And lastly, government debt and debt servicing have increased as a proportion of GDP for the average borrower.[16]

In summary, the descriptive statistics support the notion that two groups of members exist today at the IMF: a group of less-developed countries who are debtors and a group of developed countries who are creditors. Moreover, IMF lending today is driven by the need to help finance fiscal adjustment in environments of debt and/or capital account crises.

3. Measuring Credit Risk

3.1 Can the risk be measured at the IMF?

The descriptive statistics suggest that the characteristics of current IMF borrowers, relative to creditors (and, for some measures, relative to previous IMF borrowers), have deteriorated over time. The question, however, is whether the credit risk of IMF borrowers has deteriorated between the 1970s and 2005. The IMF has not ignored the level of credit risk on its balance sheet. For example, the IMF (2004) examines how credit-risk models are used by other institutions to measure the riskiness of their portfolios, and, consequently, what level of precautionary balances need to be held against such credit risk. The IMF argues, however, that the application of credit-risk models to their organization is not feasible, given the nature of its portfolio and its lending mechanisms. Specifically, there are three reasons why the IMF argues against the use of credit-risk models.

First, the IMF argues that the implementation of credit-risk models depends on diversification: the credit portfolio under assessment needs a large number of assets in order to estimate the expected distribution of returns. This is not consistent with the

[15] Interpretation of the importance of reserves is confounded by the fact that countries with flexible exchange rates do not need to hold high levels of reserves.

[16] The institutional characteristics of IMF borrowers remained stable or improved over the period 1980–2003. Across measures of bureaucratic quality, corruption, and democracy, there was little improvement for IMF borrowers. Investor protection, law and order, and stability, however, improved, leading to an overall decrease in political risk. But, relative to creditors, they still had considerably less institutional development. Lastly, there are important differences in legal origin. IMF borrowers tended to have French legal origin in the 1980s, and socialist legal origin in the 1990s.

IMF's lending experience. Second, credit-risk models depend on estimating default probabilities; this measure has little relevance to the IMF, however, since it has not experienced a default in the past 50 years.[17] Furthermore, the IMF need not be concerned with high default probabilities, since structural adjustment programs, conditionality, and preferred creditor status help to assure repayment. Third, the implementation of credit-risk models would imply the formulation of country credit ratings and, consequently, credit limits. However, the "Board has consistently viewed a country credit rating system for individual Fund members as undesirable" (IMF 2004). This is justified on the basis that such a rating system, if it could be implemented and subsequently made public, could signal a lack of confidence in a borrowing country. This desire not to utilize country ratings is also justified by the need for "uniformity" amongst IMF members. The use of collateral in this context is also undesirable, since the "Fund does not require collateral for its lending and it is difficult for the Fund to limit exposure" (IMF 2004).[18] The IMF therefore concludes that current credit-risk models are not suitable.

The reasons the IMF gives for this conclusion, however, are not without contention. First, the concern is misplaced that country ratings, if made public, could signal a lack of confidence. It would seem disingenuous to deny markets the information content of IMF country ratings. In fact, the IMF's Article IV consultations are an implicit country rating system, and the IMF regularly conducts debt-sustainability analyses for program countries. These two sources of country-level information could be easily disseminated to markets. Presumably, more information is better—it is hard to imagine that markets would be less efficient with this additional information.[19] Additional information would also help to assure that the disciplining effect of markets is fully employed, without undermining the confidence-building benefits of IMF programs.[20]

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[17] The IMF has suffered losses in terms of net present value. Future work will seek to quantify these losses.
[18] This is disturbing in light of the reaffirmation of access limits in the G-7 Action Plan.
[19] In the absence of private information, it is unlikely that the IMF's country credit ratings would differ much from those provided by private firms. If private information was available, it might not be useful, since it would not be verifiable.
[20] Alternatively, there may be no need to release this information as long as the IMF bases the rate of charge on an assessment of credit risk. Since the IMF is a "club," however, such information releases, in general, are unlikely.

Second, while the nature of the IMF's portfolio renders certain standard models (such as value-at-risk models) inappropriate for assessing credit risk, this does not preclude the use of other risk-based measures. Specifically, measures of expected credit loss, or a risk-based capital adequacy model in the spirit of Basel II, could be implemented without making strong assumptions about the expected distribution of returns for the IMF's portfolio. This approach is feasible, since the risk-weighted measures used in Basel, although not as technically sophisticated as most value-at-risk models, still allow for an assessment of risk.

Third, the claims are not necessarily true that it would be difficult to estimate default probabilities for IMF borrowers due to the lack of previous defaults, and that credit risk is lessened by the effectiveness of structural adjustment programs, conditionality, and the "guarantee" suggested by preferred creditor status. The lack of previous default experience implies nothing about future default probabilities, particularly given the dramatic shift in the IMF's loan portfolio from previous years. Moreover, there is no compelling empirical evidence to suggest that conditionality and structural adjustment have led to higher repayment rates. In fact, conditionality is often not enforced (Goldstein 2001), and thus one cannot rely on its existence as a risk-mitigating tool. Most importantly, preferred creditor status offers no explicit guarantee that a country will not default.[21] The goal of this paper is not to calculate the exact level of risk on the balance sheet, but to determine whether there has been a relative change in the level of credit risk since the 1970s.

3.2 Measuring expected credit loss: caveats

The calculation of expected credit loss (ECL) is not necessarily intended to provide a precise estimate of the credit risk of the IMF's portfolio. That is, it is not a prediction of expected IMF losses from an accounting perspective; rather, ECL is a proxy for expected

[21] In the past, the enforcement of access limits mitigated the potential losses of IMF resources, since the cost of compliance with preferred status was relatively small. With the advent of exceptional programs, however, and the accumulation of large debt burdens, the cost of honouring the principle of preferred status may induce borrowers to default on their obligations to the IMF. This could undermine the consensus of preferred creditor status, and thus raises new issues with respect to the required level of precautionary balances that must be held by the IMF.

economic losses. Essentially, it is a measure of the risk being borne by the IMF, and how this risk has evolved over time. In this way, the measure of ECL can also be thought of as describing the burden being placed on the IMF's risk-mitigation techniques (i.e., preferred creditor status). As an institution that exists to mitigate and manage risk among its members, understanding the nature of the risks associated with its lending activities is critical for the proper governance of the IMF. While the explicit purpose of this exercise is to assess whether there has been a *change* in credit risk, it is still useful to consider the *level* of credit risk at a point in time. Therefore, in addition to measuring the relative changes in risk, this paper estimates a precise measure of expected credit loss, and contrasts it to the level of precautionary balances held by the IMF.[22]

3.3 Determining sovereign risk

In order to estimate the notional expected credit loss of the IMF's portfolio, we use sovereign credit ratings from Moody's (and/or Standard & Poor's) to assess the credit-worthiness of IMF borrowers.[23] That is, each borrower is assigned a probability of default on its outstanding obligations to the IMF. In this paper, we will use sovereign credit ratings, and the implied probability of default associated with such ratings, as the basis for determining the creditworthiness of borrowers. A quick examination of the current credit ratings of IMF borrowers is revealing. For example, Table 2 lists the credit ratings of non-Poverty Reduction and Growth Facility (PRGF) IMF borrowers reported by Moody's as of 2004.[24] The striking feature is the overall poor credit quality of IMF borrowers: the typical country has a credit rating of Ba or lower. Essentially, the mode credit rating of the IMF's credit portfolio is "speculative grade."

The usefulness of sovereign ratings for constructing a measure of the riskiness of the IMF's portfolio is limited, however, by the "unrated" nature of many IMF borrowers—most sovereigns were not rated until the mid-1990s. For example, during the period 1981–90, only 3 per cent of IMF borrowers had a Moody's rating, increasing to

[22] That is, if the IMF were subject to market discipline, what level of reserves (capital) would be necessary for its credit portfolio?

[23] Using sovereign credit ratings from Standard & Poor's produces quantitatively similar results.

[24] This paper considers borrowers who access only the General Resources Account and excludes PRGF borrowers.

30 per cent in the 1990s and 56 per cent by 2003. This lack of coverage would suggest that is difficult, if not impossible, to estimate the riskiness of the IMF's portfolio. However, one can estimate credit ratings for those countries that are not rated. Using Cantor and Packer's (1996) approach, one can construct an empirical model for estimating sovereign ratings.

3.4 Determinants of sovereign credit ratings

Cantor and Packer's (1996) approach is straightforward. Given a set of fundamental macroeconomic characteristics, one can estimate the following ordered probit model:

$$Prob(R_{it}) = F(X_{it}), \tag{1}$$

where the R_{it} is the Moody's rating for country i at time t, and X_{it} is a set of macroeconomic and country-level institutional variables. The ratings R are ranked 1 = Aaa, 2 = Aa, 3 = A, 4 = Baa, 5 = Ba, 6 = B, and 7 = Caa/Ca; a higher numerical value is therefore correlated with a lower credit rating. The X's can include the growth rate of real GDP, the current account deficit and the rate of inflation, the level of per capita GDP, the degree of openness, and other macro variables that may be correlated with country default (such as measures of political risk).

Table 3 reports the results of estimating (1) using a panel-ordered probit model. The results are broadly similar to most studies of the determinants of sovereign credit spreads. Across the five specifications, higher per capita real GDP and real GDP growth are associated with better credit ratings. Poor macroeconomic policy is negatively related to credit risk, since higher inflation rates suggest lower credit ratings. The current account, government balance, and degree of openness are not significantly correlated with ratings. However, higher debt interest payments as a proportion of government revenues are correlated with a lower credit rating. The inclusion of a measure of political risk suggests that less political risk (a higher score in the political risk index) is correlated to better credit ratings. Breaking the political index into its components reveals the correlations that affect ratings. Better bureaucratic quality and investor protection are

correlated with better credit ratings. Interestingly, more stable regimes receive lower credit ratings, while the degree of democracy, corruption, and law and order are not significant. Lastly, institutional origins are considered: countries with French, Socialist, and Scandinavian legal origins are more likely to have lower credit ratings than countries with English legal origin. The exercise is repeated for finer credit ratings in Table 4. In this case, the credit ratings are broken into their subcategories: for example, there are seven broad letter categories, with each letter rating broken into three categories. The results of estimating the model by ordered probit are qualitatively similar to the coarser ratings results. The robustness of the results is checked by using Standard & Poor's credit ratings in place of Moody's. The results for the estimation of (1) are qualitatively and quantitatively similar (Table 5).[25]

The estimated coefficients can be used to construct predicted ratings for those country-year pairs when ratings are not available.[26] The in-sample prediction of sovereign credit ratings reveals that the use of even a very parsimonious model can produce reasonable predicted values. For the entire sample, nearly 60 per cent of the Moody's ratings are predicted exactly (Table 6), and 97 per cent of the predicted values fall within one letter grade of the actual rating. The model performs well for predicting Aaa, Aa, Ba, and B, while performing poorly for A. This poor performance for the A category is not particularly distressing, given that the predicted ratings do not diverge significantly from the A range, which has a default rate of zero per cent. Similarly, the model tends to overpredict for B- and Ba-rated countries, thus underestimating the default rate and expected credit loss for these countries.[27]

[25] The results (not shown) are similar for estimates that use "fine" credit ratings.

[26] When there is insufficient macroeconomic data to generate a predicted credit rating, the country is assigned a rating based on its average rating. Where no data exist whatsoever, the country is assigned a B rating. This is consistent with the Basel II approach of assigning a 100 per cent risk weight to unrated sovereigns. This group of countries constitutes only 3–5 per cent of the portfolio for any given year.

[27] Extensive robustness tests were conducted in order to determine the optimal prediction model. While some specifications produced more accurate results, this was typically at the expense of lower sample coverage. Higher accuracy, however, did not quantitatively change the measure of expected credit loss.

3.5 Expected credit loss

The expected credit loss of the IMF's portfolio can be assessed utilizing the actual and predicted credit ratings from estimating (1). The expected credit loss is constructed as follows. For every year, the IMF's exposure under the General Resources Account for each country is multiplied by the respective country's default rate and then summed across all borrowing countries:

$$ECL_t = \sum_{i=1}^{n} EXP_{it} * (DEF_{it} * LGD), \qquad (2)$$

where ECL_t is the expected credit loss (ECL) at time t for the next period (year), EXP_{it} is country i's exposure in SDRs to the IMF, DEF is the respective default rate associated with the country's credit rating, and LGD is the percentage loss given default. The loss given default is assumed to be 67 per cent, as estimated from observed sovereign defaults (Moody's 2003).[28] The measure of ECL can be estimated for the period one year forward to up to five years forward. In the case where ECL is calculated more than one year forward, cumulative default rates are used. Thus, the 5-year ECL is a measure of cumulative expected losses five years forward.

Figure 7 shows estimates from 1975 to 2005 for the 1-year-forward ECL, and the 2-, 3-, and 5-year cumulative ECL.[29] The absolute amount of the ECL rose sharply during the early 1980s, as the IMF intervened in the Latin American debt crisis, but then fell again until the mid-1990s. IMF lending to the transition economies, through the Asian crisis, and the large programs to Brazil, Argentina, and Turkey, have recently led to a dramatic increase in ECL, with estimates for 2004 at SDR2.6 billion (the 5-year cumulative ECL is over SDR9 billion). However, the early repayment of Brazil and Argentina has led to a rapid fall in ECL.

[28] This measure is consistent with the LGD in the Argentine case.

[29] The measures of expected credit loss are based on constant levels of exposure over the exposure period. While one could argue that exposures should decline as payments are made, this is not necessarily true: IMF program lending often results in loans being "rolled over," at even higher levels of exposure.

The measure of ECL assumes that the risk borne by the IMF corresponds to the respective sovereign credit rating without any adjustment for the presence of preferred creditor status and program conditionality. In order to generate a point estimate of ECL that may reflect these features of IMF lending, we re-estimate the model under the assumption that each country's credit rating is one notch higher than observed in the data; Figure 8 shows the results.[30] While the "adjusted" measure of ECL is lower in absolute terms—the level of 1-year ECL is only SDR0.9 billion in 2004 and 5-year ECL is SDR4.8 billion—the profile of change in risk remains virtually the same. Nevertheless, the level of 5-year ECL has been substantial in absolute terms during the past 10 years.

The respective measures of ECL and adjusted ECL are compared with the level of precautionary balances in Figures 9 and 10. In the case of the simple ECL measure (Figure 9), it is clear that the current level of precautionary balances (as reported in the IMF's *Annual Report* 2005) was insufficient from 1997 to 2004 given the 5-year-forward ECL. But, interestingly, the level of 5-year-forward ECL in 2004 was consistent with the projected level of precautionary balances (SDR10 billion) in 2010. On the other hand, the "adjusted" measure of ECL (Figure 10) would suggest that the IMF is over-accumulating precautionary balances. For the remainder of the paper, we will focus on the unadjusted measure of ECL given above.

Figure 11 shows the ratio of ECL to total loans. The ratio of 1-year-forward ECL to total loans increased dramatically in the late 1970s, but then remained stable through to the mid-1990s. From the Asian crisis onwards, the ratio of ECL to total loans increased from 1.6 per cent to over 4.5 per cent (the 3- and 5-year cumulative default rates show an even greater increase in the ratio of ECL to total loans—results not shown). Again, it would appear that the IMF was bearing more risk on its balance sheet.

A further examination of the data highlights the source of the increased riskiness of IMF lending. Figure 11 shows the ratio of ECL to total loans for those IMF borrowers

[30] Adding one notch to the sovereign credit rating is standard practice for assessing the credit risk of borrowers that access funds from international financial institutions.

that have exceptional access, as defined by IMF borrowing above 300 per cent of quota.[31] From 1975 until 1995, exceptional access lending did not constitute a large proportion of IMF credit risk. Since 1997, however, when formal exceptional access guidelines were introduced, exceptional access lending has greatly increased, primarily to countries with poor credit ratings. Consequently, the one-year-forward ECL attributable to exceptional access lending rose from only SDR206 million in 1996 to over SDR2879 million in 2003, and the ratio to total loans increased from 0.5 per cent to over 4.4 per cent. Given that total ECL was SDR732 million and SDR3041 million in 1996 and 2003, respectively, this implies that the proportion of ECL attributable to exceptional access lending has risen from 28 per cent to over 95 per cent. Simply, the credit risk on the IMF's balance sheet is increasing due to exceptional access lending. Lastly, Figure 12 shows the ratio of precautionary balances to 1-year-forward ECL. Again, the ratio fell steeply from 1975 until 1983, after which it recovered to more reasonable levels in the early 1990s. As before, however, the advent of the Asian crisis returned the ratio of precautionary balances to 1-year ECL to its level of the 1980s.

The calculation of expected credit loss suggests that the IMF is bearing an increasing amount of risk on its balance sheet through its exposure to countries borrowing under exceptional access lending. Moreover, it appears that the ratio of expected credit loss to the level of precautionary balances has recently been historically low.[32]

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[31] "Exceptional access" in this case is based on the de facto definition: countries whose IMF obligations exceed 300 per cent of quota as defined in the IMF data base.

[32] The measure of expected credit loss is based on the assumption that the distribution of credit ratings remains stable over time. To account for the evolution of credit risk and its effect on expected credit loss, we estimate the transition matrix for the entire sample of countries and apply it to IMF borrowers. Interestingly, there is little change in the measure of ECL over the sample period of 1985 to 2005. The exercise is repeated using a transition matrix for only IMF borrowers. Again, there is little difference in the measure of ECL. Essentially, the transition matrix for IMF borrowers is neutral – there is no strong evidence that ratings migrate up or down. These results are consistent with Felushko and Santor (2006). In that paper, we estimate a model of the effect of IMF program lending on changes in future sovereign credit ratings. We find that IMF program lending has no impact on the probability of an upgrade to sovereign credit rating one year forward.

3.6 Basel II capital requirements

The measure of ECL suggests that the IMF is bearing increasing credit risk in its portfolio. In order to check the robustness of these results, we examine the evolution of risk on the IMF's balance sheet through the lens of Basel II.[33] In the Basel framework, the risk borne on a bank's balance sheet, and the associated capital requirement, can be measured in two ways: the standard (foundation) approach and the internal-ratings-based (IRB) approach.[34] Each will be considered in turn.

Under the standard approach, banks must hold capital against their risk-weighted assets. For sovereign exposures, the proposed risk weights are as follows:

Rating	AAA to AA-	A	BBB	BB to B	C	Unrated
Risk weight	0	20	50	100	150	100

Then, the capital requirement is calculated as 8 per cent of risk-weighted assets. Under the IRB approach, however, the notion of "expected" credit loss is not the basis of capital requirements. Rather, given that banks provision against expected loss out of current income, it is the unexpected losses that require capital.[35] The IRB approach utilizes this notion of unexpected losses for calculating capital requirements. The IRB approach for capital requirement K for each period t is calculated as follows:

$$K_t = \sum_{i=1}^{n} K_{it} , \qquad (3)$$

[33] The Basel II framework was designed to assess risk for highly granular portfolios, and was not intended for the lumpy nature of IMF lending.

[34] The IRB approach was developed to allow banks to utilize their own sophisticated internal-risk models, and the history of their associated credit-rating behaviour, in order to calculate capital requirements, instead of relying on the cruder risk assessments implied by the foundation approach.

[35] The precautionary balances held by the IMF can be thought of as capital held against expected and unexpected losses. The IMF, however, does not explicitly provision against specific losses.

where

$$K_{it} = LGD \times N\left(\frac{N^{-1}(PD_{it}) + \rho_{it}^{1/2} N^{-1}(0.999)}{\sqrt{1-\rho_{it}}}\right) \times EAD_{it} - (PD_{it} \times LGD \times EAD_{it}), \quad (4)$$

where K is the capital requirement for each asset risk category $i = 1,\ldots n$; LGD is loss given default; N is the cumulative normal distribution; ρ is the correlation between assets; EAD is exposure at default; and PD is the probability of default for the respective risk category. Therefore, the total capital requirement is the sum of capital charges for each asset class. The correlation between assets, ρ, is set by the Basel committee as follows:

$$\rho(PD)_{it} = 0.12 \times \left(\frac{1-e^{-50 \times PD_{it}}}{1-e^{50}}\right) + 0.24 \times \left(1 - \frac{1-e^{-50 \times PD_{it}}}{1-e^{50}}\right). \quad (5)$$

Additionally, the Basel II committee suggests that the exposure at default can be adjusted by the following maturity factor:

$$(1-1.5 \times b(PD))^{-1} \times (1 + (M-2.5) \times b(PD)), \quad (6)$$

where M is the average maturity and $b(PD)$ is the adjustment to maturity:

$$b = (0.08451 - 0.05898 \times \log(PD))^2. \quad (7)$$

The first term of (4) represents unexpected losses and the second term represents expected losses. Since expected losses are provisioned for under prudential risk management, they are subtracted from required capital under Basel II.

The Basel II IRB framework described above is implemented using the IMF's credit portfolio under the following assumptions. The LGD is set at 67 per cent and the EAD is the outstanding IMF credits owing.[36] For simplicity, maturity is set at 2 years (Illing and Paulin 2004), although average IMF exposures are much longer (and would imply a higher capital requirement). The asset categories are assigned on the basis of

[36] The level of EAD initially excludes undrawn commitments, but this can be added in future work. This would only serve to increase capital requirements in the late 1990s.

sovereign credit ratings, as is the probability of default. When sovereign credit ratings are not available, they are estimated as before. For countries with ratings of Baa or higher, the probability of default is set arbitrarily low at 0.01 per cent to 0.04 per cent for Aaa to Baa.

Figure 13 shows the capital requirements under the standardized (foundation) approach. Capital requirements rise from modest levels in the late 1970s to over SDR5.4 billion in 2003, although this fell considerably by the end of 2005. Unsurprisingly, the standard approach mimics the profile of ECL. The consequences for the IMF are made more explicit by the calculation of IRB capital requirements. Figure 14 shows the estimation of (3) for the IMF's portfolio from 1975 to 2004. The results are very similar to the profile of ECL, with dramatic increases in capital requirements from SDR4.7 billion in 1995 to over SDR10.0 billion in 2004, although it falls to SDR4.5 billion in 2005. Figure 15 plots the ratio of precautionary balances to capital requirements. From the early 1980s onwards, the ratio falls below 100 per cent, and remains close to 40 per cent for the remainder of the 1980s and 1990s, but rises dramatically at the end of the period. This suggests that the level of precautionary balances may have been inadequate relative to the risk being borne on the IMF's balance sheet.

3.7 Market-based measures of expected credit loss

The measure of expected credit loss and Basel II capital requirements depends heavily on the use of sovereign credit ratings and their associated default histories. In order to check the robustness of our measure of expected credit loss, we also consider a "market-based" approach. Buckle, Cunningham, and Davis (2000) estimate a "point-in-time" default rating based upon bond yield spreads. In their set-up, the default rate is a function of the yield spread between the sovereign bond and the risk-free rate for a given maturity:

$$\frac{\text{spread}}{\text{gross yield}} = \left(\frac{y_{it} - r}{1 + y_{it}} \right), \tag{8}$$

where y_{it} is country i's yield spread at time t of the appropriate sovereign bond and r is the risk-free rate.

In order to implement this measure, the yield spread is taken from the EMBI+ (the difference between a basket of U.S.-dollar-denominated sovereign bonds or varying maturities and the corresponding basket of U.S. government securities). Unfortunately, the limited coverage of the EMBI+ data restricts the breadth and time frame of the analysis. Thus, the measure of expected credit loss implied by market interest rates is calculated and then compared with the standard measure of ECL only for those countries with market interest rate data. Figure 16 shows the results of estimating (8). The pattern of market interest rate-based expected credit loss follows the more standard measure, although at a higher level and with more volatility. Nevertheless, the market interest rate measure of ECL confirms the previously observed pattern: the IMF was taking on more credit risk during the period 1997–2004 than before.

4. Discussion and Conclusion

The evidence obtained from examining the IMF's portfolio since 1961 indicates that there has been a dramatic shift in the nature of IMF lending. The most striking features of this change are (i) the recent relative increase in the concentration of the portfolio, (ii) the average length of years of continuous access to IMF resources, and (iii) the deterioration of the credit quality of those borrowers who access funds. The descriptive statistics are illuminating: the average IMF borrower is relatively poorer than before (even more so when compared with creditors), and is more dependent on the IMF. Unsurprisingly, this is reflected in the sovereign credit ratings of IMF borrowers, which are, on average, speculative grade. The calculation of a simple expected credit-loss metric suggests that the credit risk in the General Resources Account has increased significantly in the past decade. Particularly, the increase in risk can be tied to exceptional access lending to countries that have poor sovereign credit ratings. This increase in risk is confirmed by the use of alternative measures of balance-sheet risk: both the Basel II capital requirement approach and the market-based interest rate approach produce similar results.

Critics of this credit-risk approach would argue that any measure of expected credit loss is inappropriate: because of the unique nature of its balance sheet and its lack of default histories, the IMF has not experienced a default in the past 50 years. Moreover, the critics would assert that the existence of preferred creditor status, and the use of conditionality, implies that the IMF faces lower credit risk than empirically suggested by any conventional credit-risk model.

The use of credit-risk models to assess the risk being borne by the IMF cannot be immediately dismissed simply because of the existence of preferred creditor status and conditionality. The fact that the IMF is in the process of adjusting its level of precautionary balances suggests that it acknowledges the increased credit risk on its portfolio. This accumulation of precautionary balances is not without concern. On the one hand, if precautionary balances are being accumulated to mitigate against credit risk, then IMF members should be concerned. Precautionary balances reflect retained earnings, and so their use against losses implies that IMF members will see a reduction in their IMF equity. On the other hand, if the rate of accumulation of precautionary balances is higher than necessary, then members would also bear costs, since precautionary balances are unremunerated. Furthermore, the accumulation of precautionary balances implies that the rate of charge and the rate of remuneration are higher and lower, respectively, than would otherwise be the case. Consequently, determining the level of precautionary balances should not be left to ad hoc decisions of the Executive Board, but should take account of the actual level of expected credit loss.

In this paper, we find that the IMF may face future increased credit risks due to the use of exceptional access. This implies that the IMF, in lieu of more standard risk-management techniques, would have to rely more heavily on the efficacy of preferred creditor status, and the effectiveness of conditionality, to ensure the integrity of its balance sheet. However, one may be concerned that recent challenges to the legal foundations of preferred credit status may diminish the effectiveness of this tool in mitigating credit risk. Similarly, if conditionality is not strictly enforced, its effect on the creditor's willingness and ability to repay may be hindered. Consequently, given the

potential violability of preferred creditor status and conditionality, the increase in the level of precautionary balances may be warranted. In any case, it is important to pursue quantitative measures of credit risk in order to better appreciate the ongoing evolution of IMF lending and the associated credit risk on its balance sheet.

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Table 1: Macroeconomic Indicators for IMF Members

	Borrowers				Non-Borrowers			
	1961-1970	1971-1980	1981-1990	1991-2004	1961-1970	1971-1980	1981-1990	1991-2004
Real GDP per capita	2828	2612	2794	2744	4411**	9429**	8829**	11766**
(US$ market)	869	882	1087	1731	1193	5752	4026	8900
Real GDP growth	4.57	4.27	2.77	1.74	5.70**	5.28*	3.14	3.38**
(per cent)	4.75	4.59	3.25	3.11	5.28	5.00	3.01	3.10
Current account/	-3.72	-4.94	-5.48	-4.16	-3.84	1.45**	-2.42**	-1.58
GDP	-3.09	-3.97	-3.95	-3.20	-0.63	-0.42	-1.13	-0.90
Inflation	8.3	14.9	42.9	91.3	3.6*	11.1**	6.3*	16.3**
	3.1	10.6	8.9	85.7	3.0	8.0	4.7	3.0
Trade/GDP	37.1	58.7	64.8	79.3	63.3**	80.2**	90.9**	93.6**
	34.9	51.7	53.8	74.6	58.5	74.6	79.7	79.0
Reserves/GDP	4.7	8.3	8.0	12.1	10.1**	18.2**	19.5**	18.8**
	3.7	6.0	5.7	10.4	6.7	12.1	11.8	11.7
Debt service/GDP	2.8	3.5	6.1	5.7	2.0	2.0**	3.7**	4.3**
	2.4	2.7	5.3	4.8	1.0	1.3	2.7	3.2
Short-term debt/	9.3	9.9	11.7	15.7	4.7**	15.5**	19.3**	15.8
GDP	7.4	7.7	9.4	12.3	0.0	12.3	12.3	14.1

Source: World Bank, IMF. **,* indicates that the *t*-statistic of the null hypothesis of identical means for the IMF and non-borrowers, for each decade subsample, is rejected at the 5 per cent and 10 per cent levels, respectively. IMF borrowers are those countries that had at least one liability to the IMF during the period. Means appear in the first row, and medians in the second row, for each variable.

Table 2: Sovereign Ratings of Non-PRGF IMF Borrowers, 2004

Moody's rating		
Baa and above	Ba and below	No rating
Lithuania	Argentina	Algeria
Panama	Brazil	Belarus
Russia	Bulgaria	Bosnia and Herzegovina
	Dominican Republic	Gabon
	Ecuador	Grenada
	Indonesia	Iraq
	Jamaica	Liberia
	Jordan	Serbia - Montenegro
	Papua New Guinea	Somalia
	Peru	Sudan
	Philippines	Uzbekistan
	Romania	
	Turkey	
	Ukraine	
	Uruguay	

Source: Moody's, IMF

Table 3: Determinants of Sovereign Credit Ratings

Ordered probit estimation
Dependent variable: Moody's credit rating (coarse)
Marginal effects

Variables	Macro (1)	Macro (2)	Macro, Political risk (3)	Macro, Political risk (4)	Macro, Legal origin (5)
GDP per capita	-1.134**	-0.626**	-0.547**	-0.411**	-0.649**
	(0.164)	(0.232)	(0.238)	(0.202)	(0.222)
Real GDP growth	-0.060**	-0.074**	-0.087**	-0.086**	-0.058**
	(0.017)	(0.020)	(0.021)	(0.022)	(0.018)
Current account/ GDP	-0.270	-0.317	-0.832	-2.406*	0.354
	(1.283)	(1.390)	(1.430)	(1.372)	(1.411)
Inflation	0.108**	0.067**	0.065**	0.078**	0.050**
	(0.021)	(0.019)	(0.020)	(0.026)	(0.021)
Government Balance/GDP		1.297	1.250	2.947	3.154
		(2.228)	(2.349)	(2.566)	(2.527)
Trade/GDP		0.176	0.157	0.222	-0.030
		(0.391)	(0.403)	(0.416)	(0.403)
Reserves/GDP		0.203	0.551	-0.831	0.123
		(1.252)	(1.195)	(1.083)	(1.106)
Interest payments/ revenue		2.949**	2.447**	3.506**	3.682**
		(0.832)	(0.837)	(0.934)	(0.830)
Developing country		2.653**	2.459**	2.588**	2.819**
		(0.402)	(0.421)	(0.457)	(0.505)
Political risk			-0.023*		
			(0.013)		
Bureaucratic quality				-1.009**	
				(0.182)	
Corruption				0.088	
				(0.113)	
Democracy				0.006	
				(0.080)	
Investor protection				-0.257**	
				(0.055)	
Law and order				-0.052	
				(0.105)	
Stability				0.142**	
				(0.036)	
Legal origin (UK excluded)					
French					0.795**
					(0.356)
Socialist					0.821*
					(0.427)
German					-0.883**
					(0.442)
Scandinavian					0.888**
					(0.373)
Wald Chi^2	92.61	234.44	207.32	256.79	246.42
Pseudo R^2	0.27	0.39	0.39	0.48	0.44
N	1089	711	615	614	701

** and * indicate significance at the 5 per cent and 10 per cent levels, respectively. Standard errors are corrected for cluster effects by country.

Table 4: Determinants of Sovereign Credit Ratings

Ordered probit estimation
Dependent variable: Moody's credit rating (fine)
Marginal effects

Variables	Macro (1)	Macro (2)	Macro, Political risk (3)	Macro, Political risk (4)	Macro, Legal origin (5)
GDP per capita	-1.133**	-0.678**	-0.595**	-0.477**	-0.681**
	(0.154)	(0.223)	(0.222)	(0.192)	(0.210)
Real GDP growth	-0.063**	-0.079**	-0.090**	-0.088**	-0.063**
	(0.017)	(0.020)	(0.021)	(0.022)	(0.018)
Current account/ GDP	-0.343	-0.415	-1.055	-2.370*	0.333
	(1.203)	(1.399)	(1.412)	(1.290)	(1.409)
Inflation	0.113**	0.074**	0.073**	0.093**	0.059**
	(0.015)	(0.023)	(0.019)	(0.019)	(0.028)
Government balance/GDP		2.197	2.319	3.998*	3.743
		(2.116)	(2.254)	(2.378)	(2.371)
Trade/GDP		0.096	0.110	0.167	-0.106
		(0.382)	(0.391)	(0.402)	(0.399)
Reserves/GDP		0.158	0.458	-0.907	0.045
		(1.236)	(1.216)	(1.184)	(1.146)
Interest payments/ revenue		2.778**	2.293**	3.207**	3.384**
		(0.771)	(0.796)	(0.875)	(0.794)
Developing country		2.522**	2.319**	2.309**	2.675**
		(0.414)	(0.439)	(0.468)	(0.528)
Political risk			-0.024*		
			(0.012)		
Bureaucratic quality				-0.954**	
				(0.159)	
Corruption				0.068	
				(0.108)	
Democracy				0.038	
				(0.070)	
Investor protection				-0.250**	
				(0.051)	
Law and order				-0.089	
				(0.099)	
Stability				0.151**	
				(0.034)	
Legal origin (UK excluded)					
French					0.678**
					(0.339)
Socialist					0.749*
					(0.406)
German					-1.071**
					(0.406)
Scandinavian					0.749*
					(0.406)
Wald Chi^2	130.05	254.24	224.51	376.08	245.14
Pseudo R^2	0.20	0.29	0.29	0.35	0.32
N	1090	711	615	614	701

** and * indicate significance at the 5 per cent and 10 per cent levels, respectively. Standard errors are corrected for cluster effects by country.

Table 5: Determinants of Sovereign Credit Ratings

Ordered probit estimation
Dependent variable: Standard & Poor's credit rating (coarse)
Marginal effects

Variables	Macro (1)	Macro, (2)	Macro, Political risk (3)	Macro, Political risk (4)	Macro, Legal origin (5)
GDP per capita	-1.215**	-0.796**	-0.768**	-0.622**	-0.794**
	(0.136)	(0.212)	(0.211)	(0.180)	(0.202)
Real GDP growth	-0.061**	-0.063**	-0.084**	-0.076**	-0.044**
	(0.017)	(0.020)	(0.018)	(0.023)	(0.019)
Current account/ GDP	-0.857	1.437	0.770	-0.827	1.601
	(1.370)	(1.754)	(1.984)	(2.046)	(1.934)
Inflation	0.157**	0.066	0.091*	0.124**	0.030
	(0.060)	(0.047)	(0.050)	(0.043)	(0.037)
Government balance/GDP		1.809	1.051	2.516	3.458*
		(2.561)	(2.290)	(2.436)	(2.415)
Trade/GDP		0.469	0.246	0.445	0.251
		(0.311)	(0.359)	(0.361)	(0.316)
Reserves/GDP		-1.269	-0.635	-2.031	-1.591
		(1.374)	(1.499)	(1.406)	(1.346)
Interest payments/ revenue		4.580**	3.418**	4.080**	5.474**
		(0.916)	(0.934)	(1.060)	(0.886)
Developing country		1.956**	1.880**	1.765**	1.915**
		(0.403)	(0.479)	(0.459)	(0.484)
Political risk			-0.017*		
			(0.010)		
Bureaucratic quality				-0.837**	
				(0.211)	
Corruption				0.022	
				(0.111)	
Democracy				0.174**	
				(0.073)	
Investor protection				-0.233**	
				(0.053)	
Law and order				-0.207*	
				(0.108)	
Stability				0.156**	
				(0.038)	
Legal origin (UK excluded)					
French					0.799**
					(0.305)
Socialist					0.923**
					(0.344)
German					-0.661
					(0.525)
Scandinavian					0.595
					(0.438)
Wald Chi^2	180.94	161.12	188.63	298.83	170.21
Pseudo R^2	0.28	0.38	0.38	0.46	0.42
N	1063	725	598	597	721

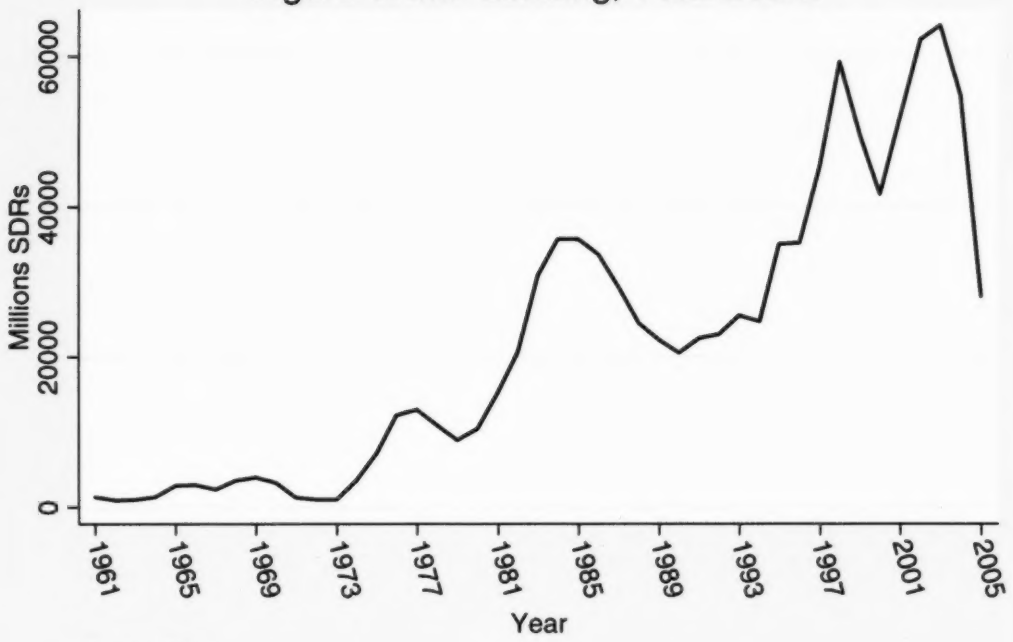
** and * indicate significance at the 5 per cent and 10 per cent levels, respectively. Standard errors are corrected for cluster effects by country.

Table 6: Predicted vs. Actual Sovereign Credit Ratings (1984–2004)

Moody's Rating	Actual	Predicted Aaa	Aa	A	Baa	Ba	B	Caa	Correct (%)
Aaa	140	110	30	0	0	0	0	0	77.7
Aa	120	48	72	0	0	0	0	0	60.0
A	71	1	17	29	19	5	0	0	40.8
Baa	103	0	2	11	55	33	2	0	53.4
Ba	105	0	0	0	33	59	13	0	56.2
B	68	0	0	0	7	18	43	0	63.2
Caa	7	0	0	0	0	0	7	0	0.0

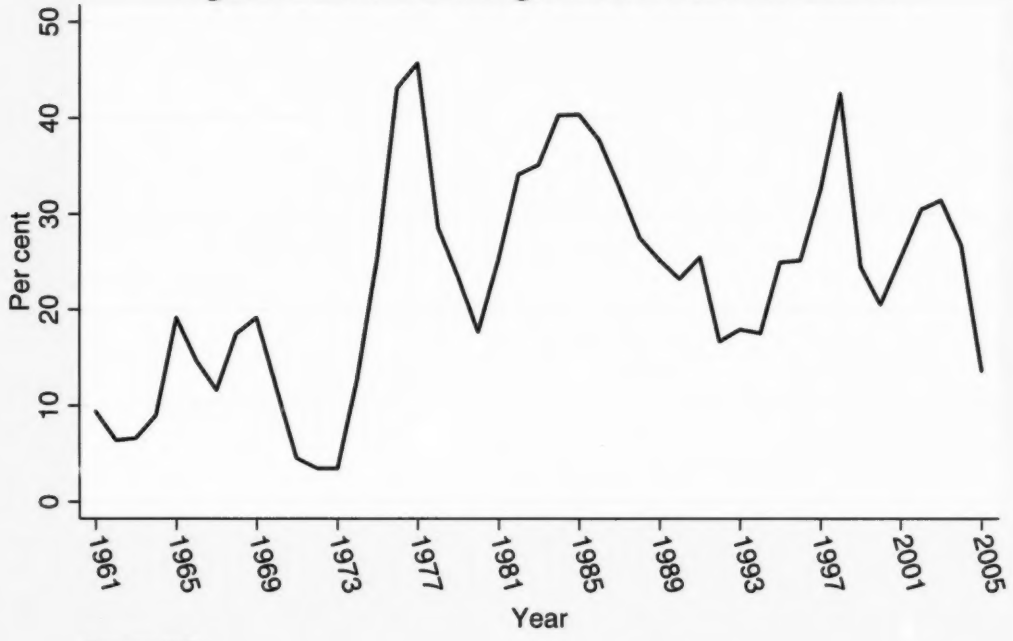
S&P's Rating	Actual	Predicted AAA	AA	A	BBB	BB	B	CCC	Correct (%)
AAA	139	114	25	0	0	0	0	0	82.0
AA	132	42	80	10	0	0	0	0	60.1
A	79	2	18	43	10	6	0	0	54.4
BBB	86	0	0	21	32	30	3	0	37.2
BB	102	0	0	5	22	59	16	0	57.8
B	52	0	0	0	5	18	29	0	55.8
CCC	3	0	0	0	0	0	3	0	0.0

Figure 1: IMF Lending, Total Loans



Source: IMF

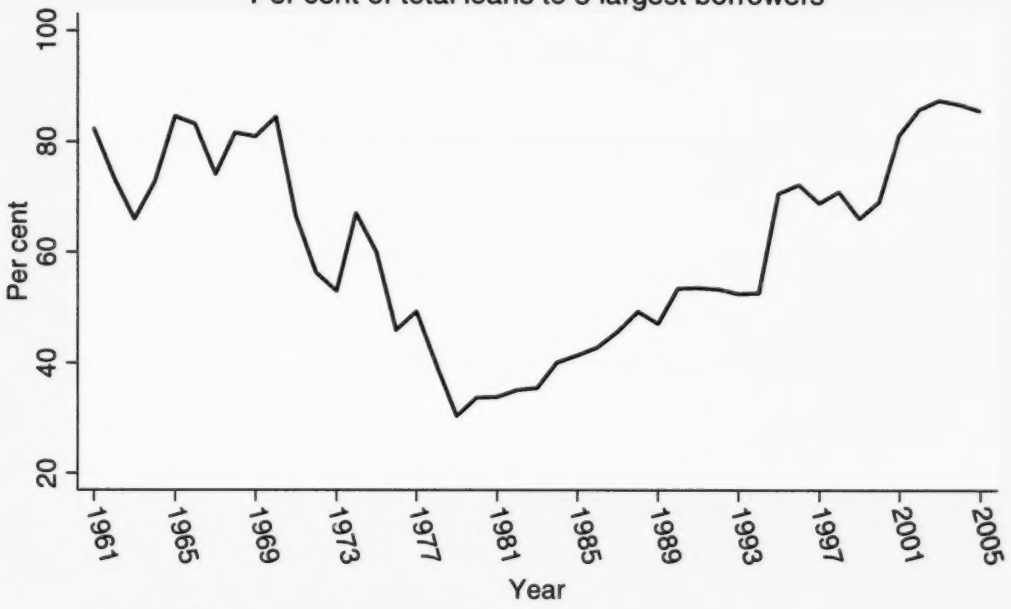
Figure 2: IMF Lending, Ratio Loans-to-Quota



Source: IMF

Figure 3: Concentration

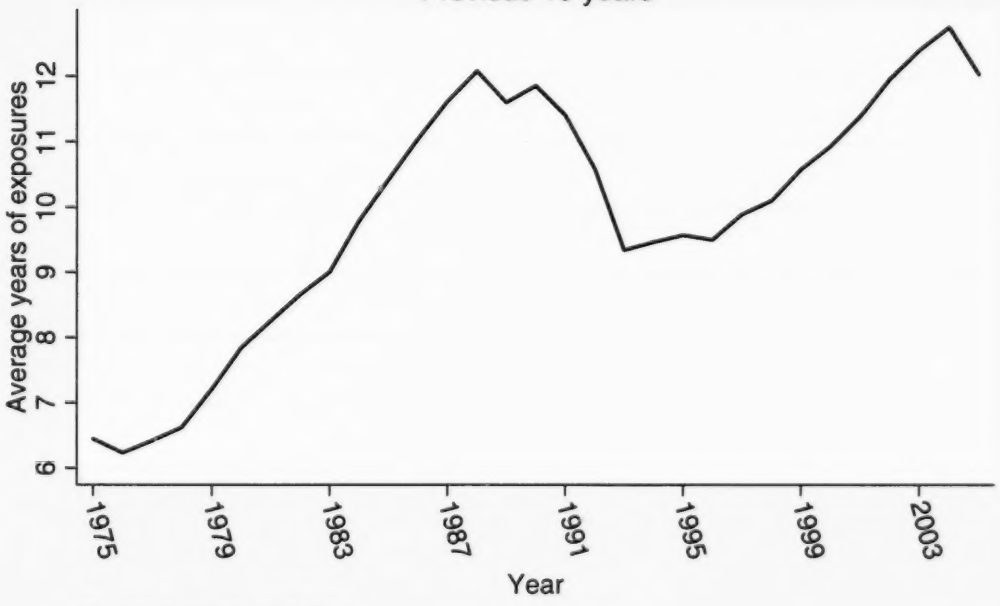
Per cent of total loans to 5 largest borrowers



Source: IMF

Figure 4: Average Number of Years of IMF Exposures

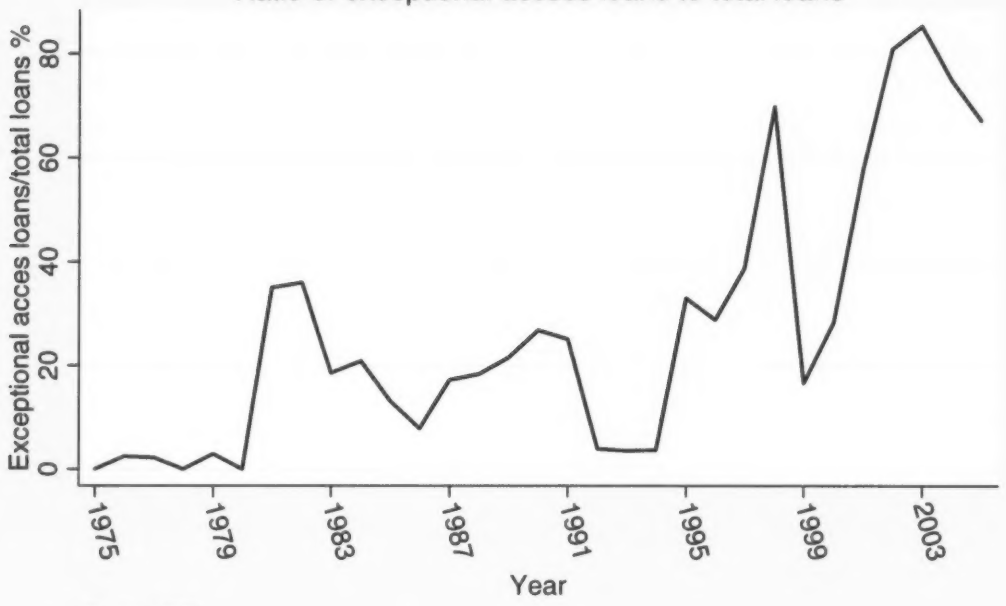
Previous 15 years



Source: Authors' calculations

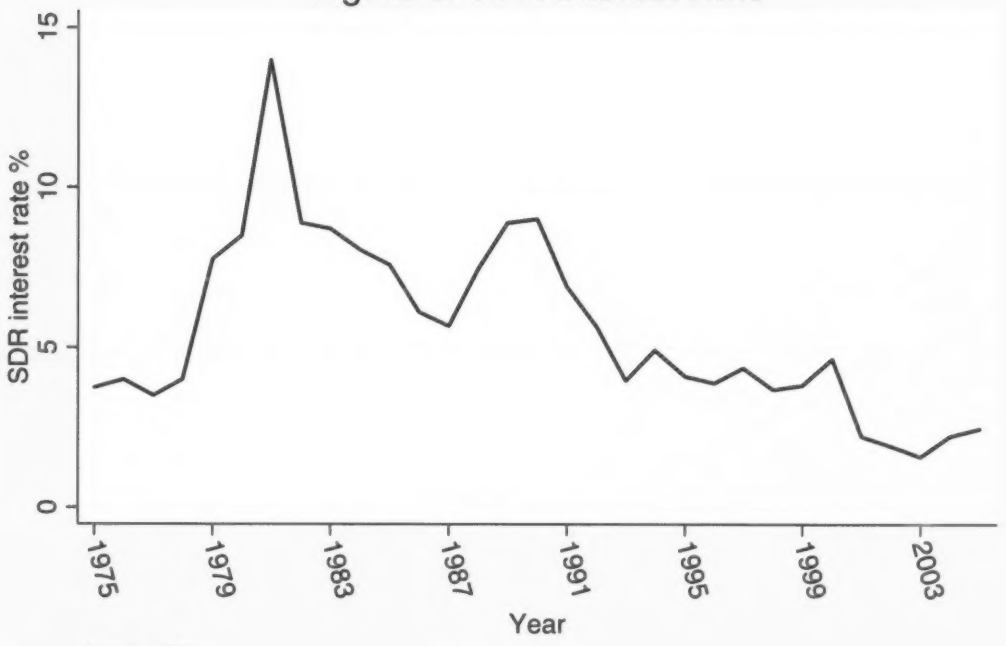
Figure 5: IMF Lending

Ratio of exceptional access loans to total loans



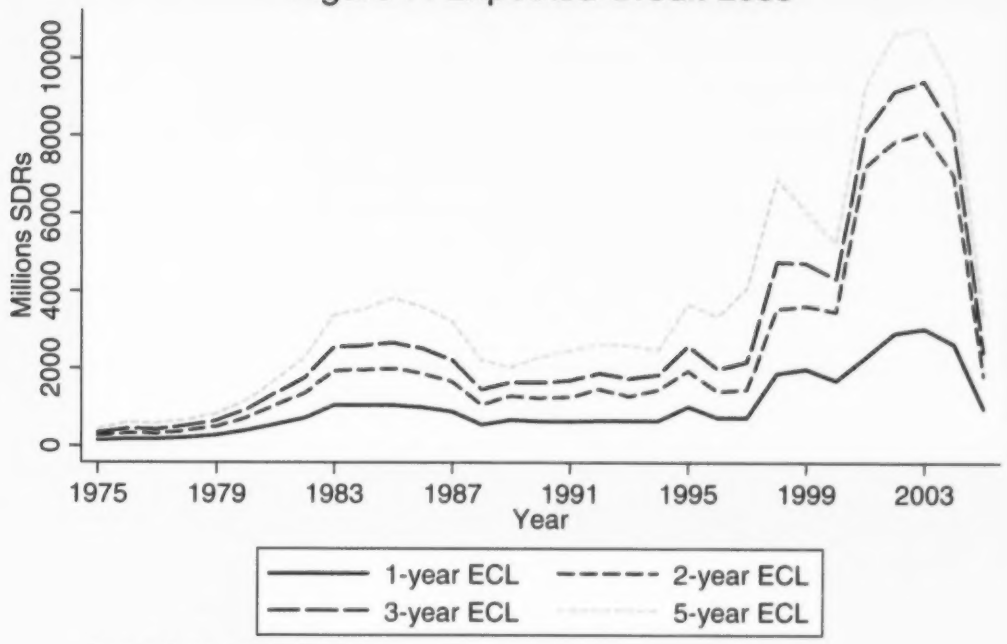
Source: IMF

Figure 6: SDR Interest Rate



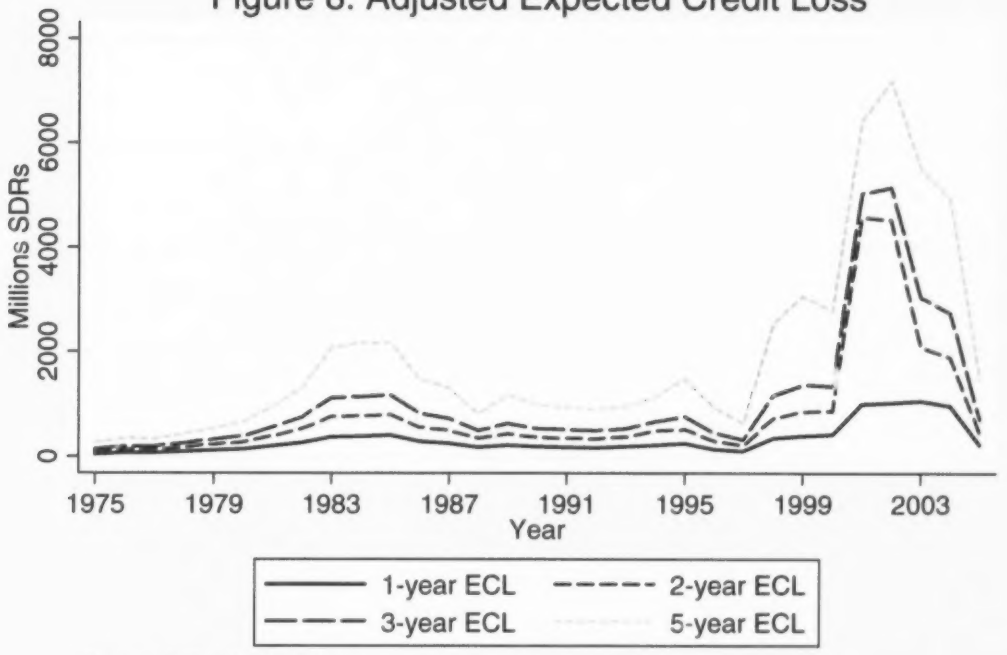
Source: IMF

Figure 7: Expected Credit Loss



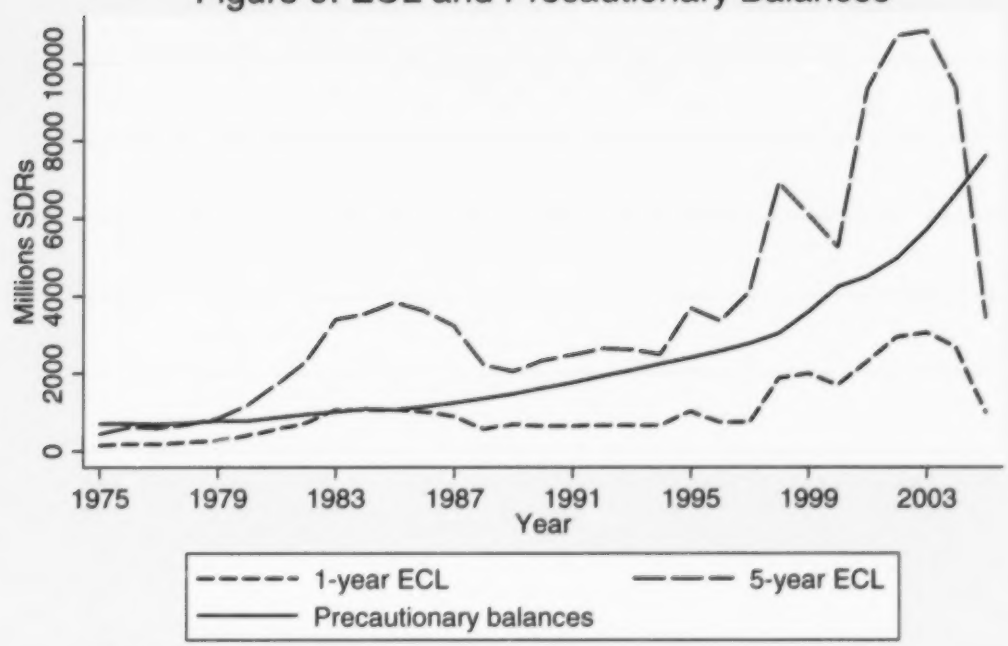
Source: Authors' calculations

Figure 8: Adjusted Expected Credit Loss



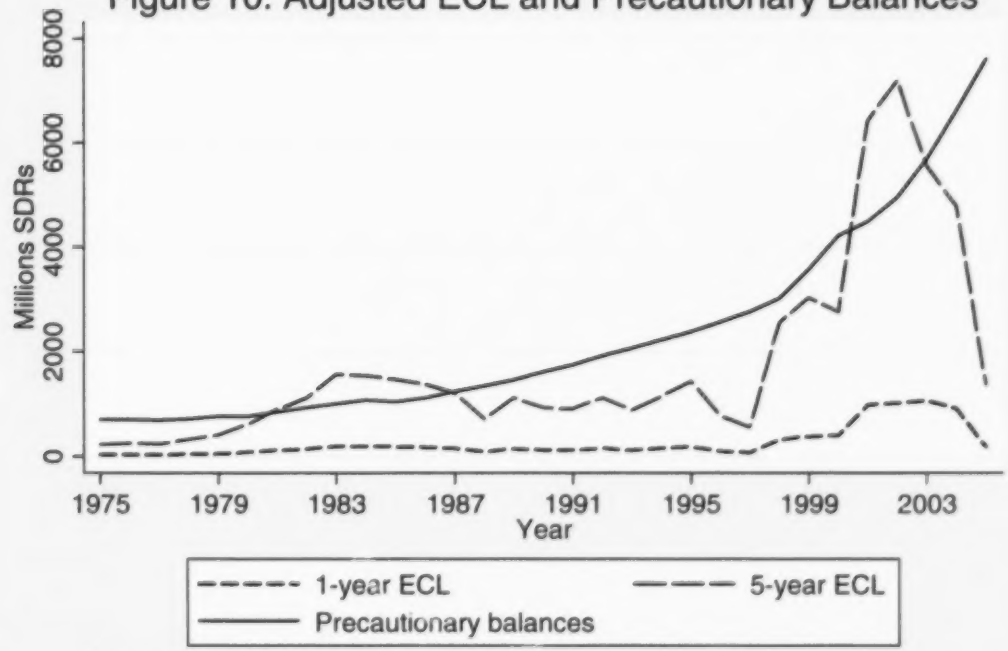
Source: Authors' calculations

Figure 9: ECL and Precautionary Balances



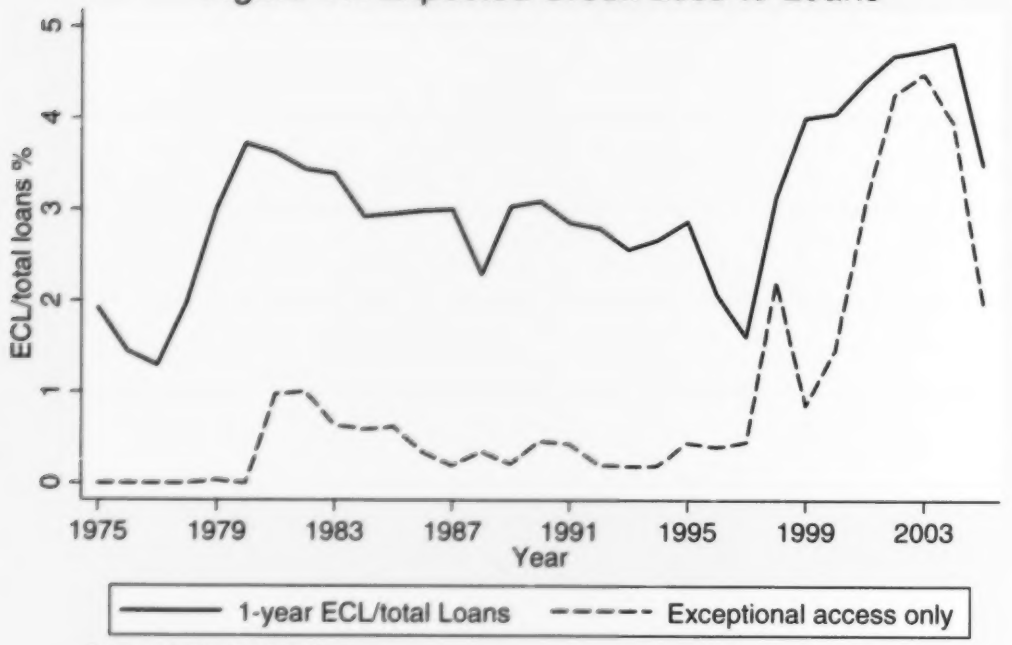
Source: Authors' calculations

Figure 10: Adjusted ECL and Precautionary Balances



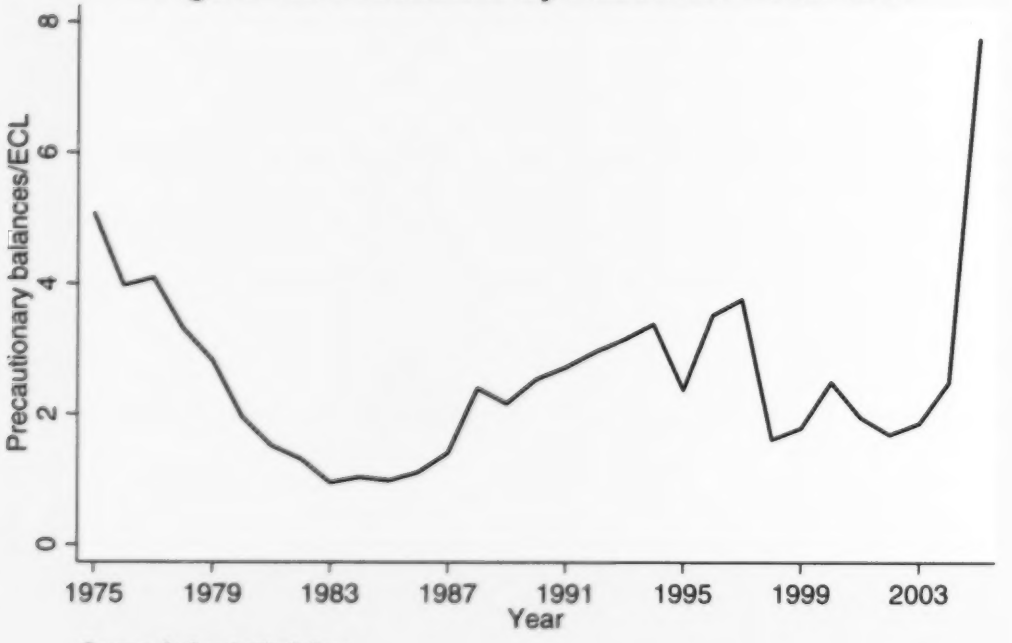
Source: Authors' calculations

Figure 11: Expected Credit Loss-to-Loans



Source: Authors' calculations

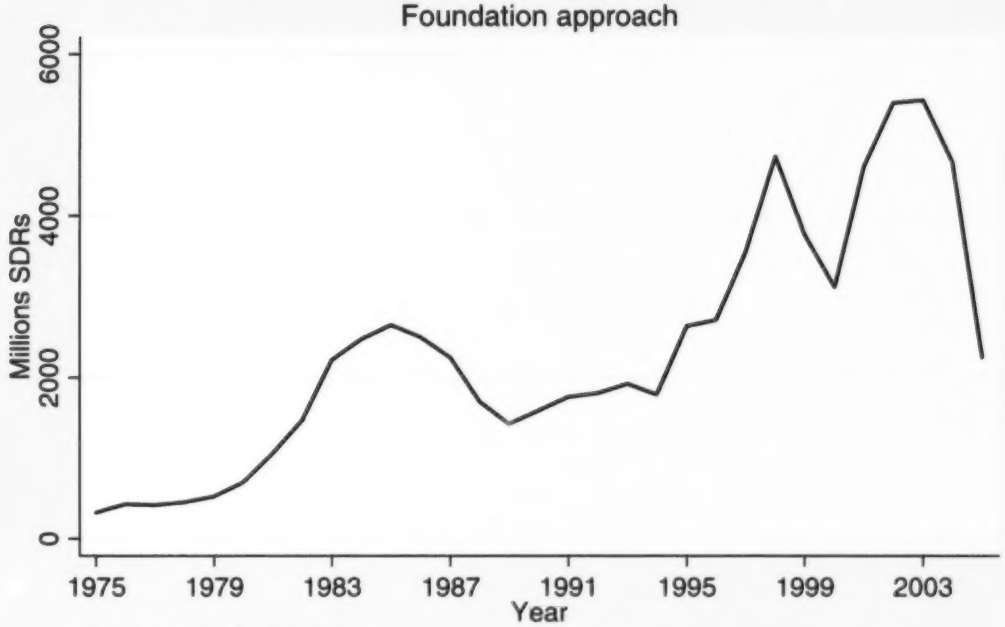
Figure 12: Precautionary Balances/1-Year ECL



Source: Authors' calculations

Figure 13: Basel II Capital Requirements

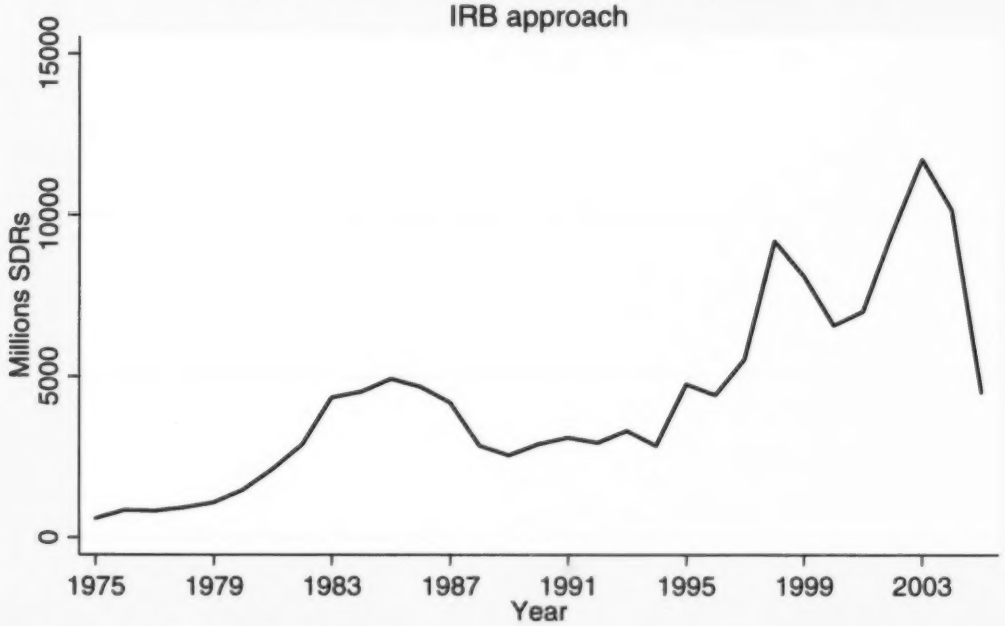
Foundation approach



Source: Authors' calculations

Figure 14: Basel II Capital Requirements

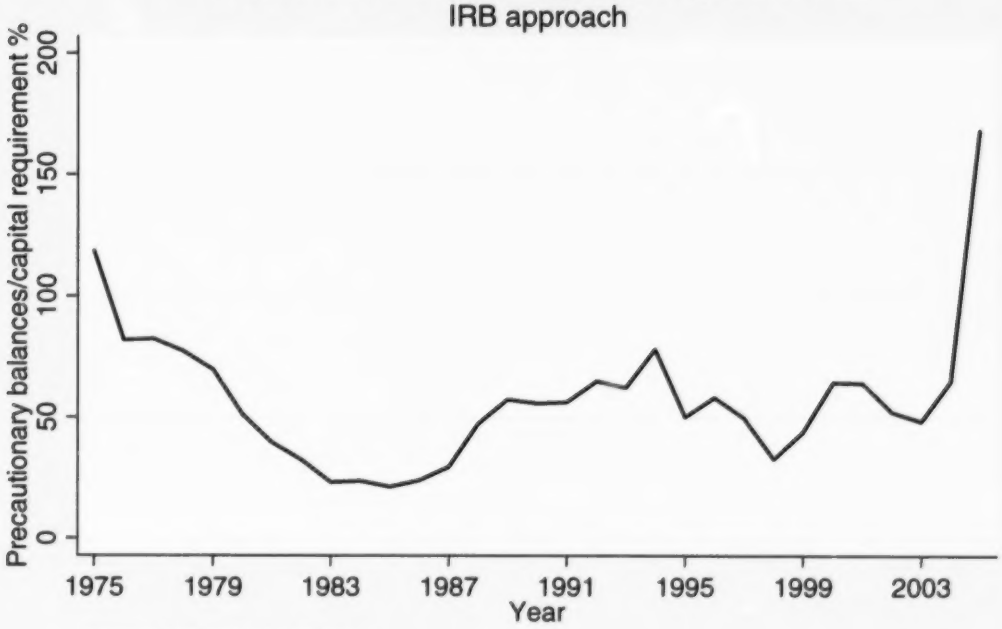
IRB approach



Source: Authors' calculations

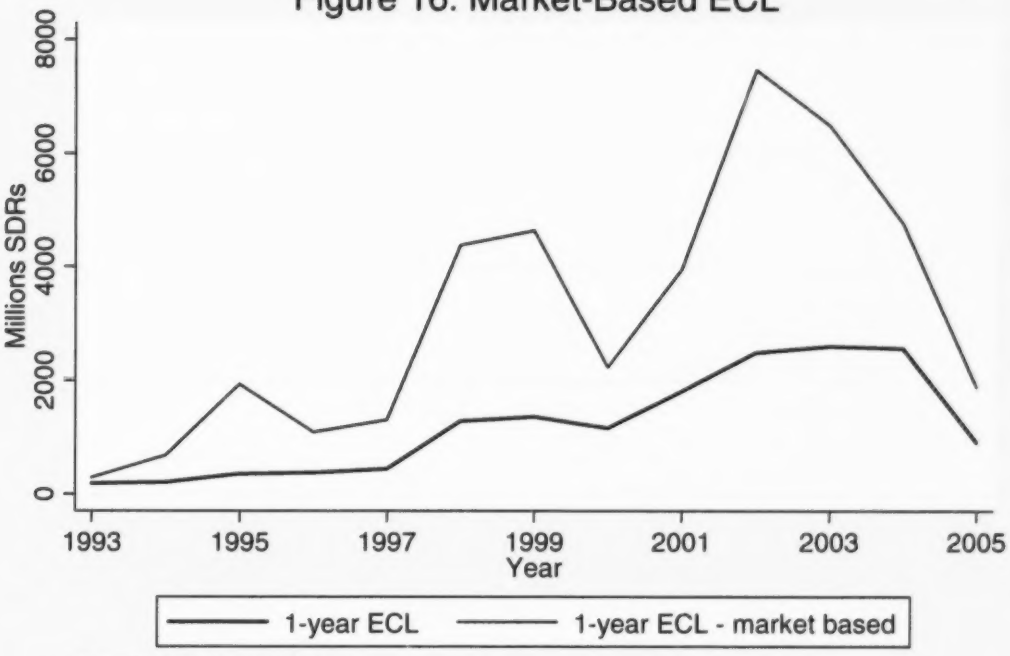
Figure 15: Basel II Capital Requirements

IRB approach



Source: Authors' calculations

Figure 16: Market-Based ECL



Source: Author's calculations

Appendix A: Glossary

exceptional access – The granting of loans in excess of 300 per cent of quota.

General Resources Account (GRA) – The account that handles the majority of lending between the IMF and member countries. It is a pool of currencies and reserve assets built up from members' quotas.

Poverty Reduction and Growth Facility (PRGF) – The PRGF (previously known as the Enhanced Structural Adjustment Facility (ESAF)) is a low-interest (0.5 per cent), long-term (up to 10 years) lending program intended for low-income nations.

precautionary balances – Balances that include the IMF's reserves and the special contingent account; they are intended to provide protection against the risk of an income shortfall and capital losses.

preferred creditor status – Debtors give priority to repayment of their obligations to the IMF over other creditors.

Special Drawing Rights (SDR) – The unit of account used by the IMF. SDRs are a potential claim on the usable currencies of the IMF members, and are defined in terms of a basket of major world currencies.

Stand-by Agreement (SBA) – Non-concessional loans intended for temporary balance-of-payment shocks.

structural adjustment programs (SAPs)/conditionality – Loans from the IMF with certain conditions regarding economic policies or structural reforms. The borrowing country is required to meet these conditions to continue the program.

Supplemental Reserve Facility (SRF) – A facility to provide financial assistance to a member country that is experiencing exceptional balance-of-payments difficulties. The difficulties arise from a large short-term financing need resulting from a sudden and disruptive loss of market confidence, which is reflected in pressure on the capital account and the member's reserves.

transition matrix – Indicates the probability that a bond rating will change within one year to another rating.

Appendix B: Data

Macroeconomic data
Source: World Bank
Real GDP/capita, expressed in US$2000.
Growth rate of real GDP.
Current account balance as a ratio of GDP.
GDP deflator inflation.
Government balance as a ratio of GDP.
Trade as a ratio of GDP
Reserves as a ratio of GDP.
Interest payments as a ratio of government revenue.
Bilateral trade as a ratio of GDP.
Debt service as a ratio of GDP.
Short-term debt as a ratio of external debt.

Ratings data
Sources: Moody's, Standard & Poor's

IMF program data
Sources: IMF IFS (IFS), IMF Annual Reports (AR)

Political stability
Source: International Country Risk Guide (ICRG)
Political risk (0 = highest risk, 100 = lowest risk).
Bureaucratic quality (0 = lowest quality, 4 = highest quality).
Corruption (0 = highest corruption, 6 = lowest corruption).
Level of democracy (0 = least democratic, 4 = most democratic).
Investor protection (0 = lowest protection, 12 = highest protection).
Law and order (0 = lowest level of law, 6 = highest level of law).
Stability (0 = least stable, 12 = most stable).

Legal origin
Source: La Porta, Lopez-de-Silanes, Schleifer, and Vishny (1999)

Bond spreads
Source: JP Morgan Emerging Market Bond Index (EMBI)
EMBI (basis-point spread between a sovereign bond basket of yields and a long-term U.S. bond), annual average and end of year

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